Having thus defined the invention, the following is claimed:

1. An electric arc welding apparatus comprising at least a first consumable electrode and a second consumable electrode movable in unison along a welding path between the edges of two adjacent, mutually grounded plates, a first power supply for passing a first welding current at a first low frequency between said first electrode and said plates, a second power supply for passing a second welding current at a second low frequency between said second electrode and said plates, each of said power supplies including a three phase voltage input operated at line frequency, a rectifier to convert said input voltage to a DC voltage link and a high frequency switching type inverter converting said DC voltage link to a high frequency AC current, an output rectifier circuit to provide a positive voltage terminal and a negative voltage terminal, and an output switching network operated at a given low frequency for directing a pulsating welding current at said given low frequency from said terminals across one of said electrodes and said plates, and a circuit for independently adjusting said given low frequency so the value of said first low frequency of said first power supply is different from said second low frequency of said second power supply.

2. An electric arc welding apparatus as defined in claim 1 wherein said first and second low frequencies are in the general range of 5 to 200 Hz.

3. An electric arc welding apparatus as defined in claim 2 wherein said consumable electrodes are advance welding wires.

4. An electric arc welding apparatus as defined in claim 2 wherein said three phase voltage input for each of said first and second power supplies is the same power source.

5. An electric arc welding apparatus as defined in claim 1 wherein said consumable electrodes are advancing welding wires.

6. An electric arc welding apparatus as defined in claim 1 wherein said three phase voltage input for each of said first and second power supplies is the same power source.

7. An electric arc welding apparatus as defined in claim 2 wherein said means for adjusting said given low frequency of at least one of said first and second power supplies includes means for causing said given low frequency to vary as a function of time.

8. An electric arc welding apparatus as defined in claim 7 wherein said three phase voltage input for each of said first and second power supplies is the same power source.

9. An electric arc welding apparatus as defined in claim 1 wherein said means for adjusting said given low frequency of at least one of said first and second power supplies includes means for causing said given low frequency to vary as a function of time.

10. An electric arc welding apparatus as defined in claim 9 wherein said three phase voltage input for each of said first and second power supplies is the same power source.

11. An electric arc welding apparatus as defined in claim 2 wherein both of said first and second power supplies include means for causing said given low frequency to vary as a function of time.

12. An electric arc welding apparatus as defined in claim 11 wherein said three phase voltage input for each of said first and second power supplies is the same power source.

13. An electric arc welding apparatus as defined in claim 1 wherein both of said first and second power supplies include means for causing said given low frequency to vary as a function of time.

14. An electric arc welding apparatus as defined in claim 13 wherein said three phase voltage input for each of said first and second power supplies is the same power source.

15. An electric arc welding apparatus as defined in claim 9 wherein said high frequency of each power supply inverter is over about 20 kHz.

16. An electric arc welding apparatus as defined in claim 15 wherein said first and second low frequencies are in the general range of 5 to 200 Hz.

17. An electric arc welding apparatus as defined in claim 16 wherein said three phase voltage input for each of said first and second power supplies is the same power source.

18. An electric arc welding apparatus as defined in claim 15 wherein said three phase voltage input for each of said first and second power supplies is the same power source.

19. An electric arc welding apparatus as defined in claim 11 wherein said high frequency of each power supply inverter is over about 20 kHz.

20. An electric arc welding apparatus as defined in claim 19 wherein said three phase voltage input for each of said first and second power supplies is the same power source.

21. An electric arc welding apparatus as defined in claim 19 wherein said first and second low frequencies are in the general range of 5 to 200 Hz.

22. An electric arc welding apparatus as defined in claim 2 wherein said high frequency of each power supply inverter is over about 20 kHz.

23. An electric arc welding apparatus as defined in claim 1 wherein said high frequency of each power supply inverter is over about 20 kHz.

24. An electric arc welding apparatus as defined in claim 2 wherein said pulsating welding currents of said power supplies are DC currents.

25. An electric arc welding apparatus as defined in claim 24 wherein said three phase voltage input for each of said first and second power supplies is the same power source.

26. An electric arc welding apparatus as defined in claim 1 wherein said pulsating welding currents of said power supplies are DC currents.

27. An electric arc welding apparatus as defined in claim 26 wherein said three phase voltage input for each of said first and second power supplies is the same power source.

28. An electric arc welding apparatus as defined in claim 2 wherein said pulsating currents of said power supplies are AC currents.

29. An electric arc welding apparatus as defined in claim 9 wherein said pulsating currents of said power supplies are AC currents.

30. An electric arc welding apparatus as defined in claim 29 wherein said three phase voltage input for each of said first and second power supplies is the same power source.

31. An electric arc welding apparatus as defined in claim 11 wherein said pulsating currents of said power supplies are AC currents.

32. An electric arc welding apparatus as defined in claim 31 wherein said three phase voltage input for each of said first and second power supplies is the same power source.

33. An electric arc welding apparatus as defined in claim 1 wherein said pulsating currents of said power supplies are AC currents.

34. An electric arc welding apparatus as defined in claim 13 wherein said pulsating currents of said power supplies are AC currents.

35. An electric arc welding apparatus as defined in claim 1 wherein each said power supplies includes a pulse width modulator for controlling the voltage between said terminals as a function of time to adjust the welding current.

36. An electric arc welding apparatus as defined in claim 2 wherein each said power supplies includes a pulse width modulator for controlling the voltage between said terminals as a function of time to adjust the welding current.

37. An electric arc welding apparatus as defined in claim 9 wherein each said power supplies includes a pulse width modulator for controlling the voltage between said terminals as a function of time to adjust the welding current.

38. An electric arc welding apparatus comprising at least a first consumable electrode and a second consumable electrode movable in unison along a welding path between the edges of two adjacent, mutually grounded plates, a first power supply for passing a first welding current at a first low frequency between said first electrode and said plates, a second power supply for passing a second welding current at a second low frequency between said second electrode and said plates, each of said power supplies including an inverter for converting AC voltage to a DC current source having a maximum current of at least 200 amperes with a positive terminal, a negative terminal, a grounded terminal and an output switching network including a first transistor based switch in series with said positive terminal, a first inductor segment, one of said electrodes and said plates, a second

transistor based switch in series with said negative terminal, a second inductor segment, said one electrode and said plates and control means for alternately turning said first switch on and said second switch off at a first switch reversing point and turning said second switch on and said first switch off at a second switch reversing point to create an AC high welding current with alternate positive and negative current pulses.

39. An electric arc welding apparatus as defined in claim 38 wherein said first and second low frequencies are in the general range of 5 to 200 Hz.

40. An electric arc welding apparatus as defined in claim 38 wherein said AC voltage is three phase line voltage with a frequency of 10 or 60 Hz and said first and second low frequencies are independent of said line voltage frequency.

41. An electric arc welding apparatus as defined in claim 40 wherein said means for adjusting said given low frequency of at least one of said first and second power supplies includes means for causing said given low frequency to vary as a function of time.

42. An electric arc welding apparatus as defined in claim 38 wherein said means for adjusting said given low frequency of at least one of said first and second power supplies includes means for causing said given low frequency to vary as a function of time.

43. An electric arc welding apparatus as defined in claim 40 wherein both of said first and second power supplies include means for causing said given low frequency to vary as a function of time.

44. An electric arc welding apparatus as defined in claim 38 wherein both of said first and second power supplies include means for causing said given low frequency to vary as a function of time.

45. The electric arc welding apparatus as defined in claim 44 wherein said low frequencies are less than about 300 Hz.

46. The electric arc welding apparatus as defined in claim 42 wherein said low frequencies are less than about 300 Hz.

47. The electric arc welding apparatus as defined in claim 40 wherein said low frequencies are less than about 300 Hz.

48. The electric arc welding apparatus as defined in claim 38 wherein said low frequencies are less than about 300 Hz.

49. An electric arc welding apparatus as defined in claim 1 wherein said plates are the ends of two adjacent pipe sections.

50. A method of electric arc welding the joint between two plates, said method comprising:

(a) moving first and second consumable electrodes in unison along said joint;

(b) passing a first pulsating welding current between said first electrode and said plates with a first low frequency;

(c) passing a second pulsating welding current between said second electrode and said plates with a second low frequency; and,

(d) varying at least one of said low frequencies as a function of time.

51. The method as defined in claim 50 wherein both of said low frequencies are varied as a function of time.

52. The method as defined in claim 51 wherein said first and second pulsating currents are AC currents.

53. The method as defined in claim 50 wherein said first and second pulsating currents are AC currents.

54. The method as defined in claim 51 wherein said first and second pulsating currents are DC currents.

55. The method as defined in claim 50 wherein said first and second pulsating currents are DC currents.

56. The method as defined in claim 51 wherein said first and second welding currents are each created by a high frequency switch inverter driven by a three phase line voltage.

57. The method as defined in claim 56 wherein said high frequency is at least 20 kHz.

58. The method as defined in claim 50 wherein said first and second welding currents are each created by a high frequency switch inverter driven by a three phase line voltage.

59. The method as defined in claim 58 wherein said high frequency is at least 20 kHz.

60. A method as defined in claim 51 wherein said first and second welding currents are independently created from the same three phase power supply.

61. A method as defined in claim 50 wherein said first and second welding currents are independently created from the same three phase power supply.

62. An electric arc welding apparatus comprising at least a first consumable electrode and a second consumable electrode movable in unison along a welding path between the edges of two adjacent, mutually grounded plates, a first power supply for passing a first welding current between said first electrode and said plates, a second power supply for passing a second welding current between said second electrode and said plates, each of said power supplies including a three phase voltage input operated at line frequency, a rectifier to convert said input voltage to a DC voltage link and a high frequency switching type inverter converting said DC voltage link to a high frequency AC current, an output rectifier circuit to provide a positive voltage terminal and a negative voltage terminal, and an output switching network for directing a welding current from said terminals across one of said electrodes and said plates, and a circuit for independently adjusting said output switching network so the value of said first welding current of said first power supply is different from said second welding current of said second power supply.

63. An electric arc welder as defined in claim 62 wherein said output switching network of each power supply includes a first switch to create positive current across one of said electrodes and said plate and a second switch to create a negative current across one of said electrodes and said plate and a circuit to operate said first and second switches to control said welding current.

64. An electric arc welder as defined in claim 63 wherein said circuit includes means for maintaining one of said switches closed and the other of said switches opened.

65. An electric arc welder as defined in claim 63 wherein said circuit includes means/or opening and closing said switches at a rate to create an AC welding current housing a selected frequency of 5-200 Hz.

66. An electric arc welder as defined in claim 65 wherein said selected frequency is different for each of said first power supply.

67. An electric arc welding apparatus comprising at least a first consumable electrode and a second consumable electrode movable in unison along a welding path between the edges of two adjacent, mutually grounded plates, a first power supply for passing a first low frequency welding current between said first electrode and said plates, a second power supply for passing a second low frequency welding current between said second electrode and said plates, each of said power supplies including a three phase voltage input operated at line frequency, a rectifier to convert said input voltage to a DC voltage link and a high frequency switching type inverter converting said DC voltage link to a high frequency AC current, an output rectifier circuit to provide a positive voltage terminal and a negative voltage terminal, and an output switching network operated at a given low frequency for directing a pulsating welding current at said given low frequency from said terminals across one of said electrodes and said plates, a master controller for creating a synchronizing signal alternating between a positive command and a negative command at a selected frequency, means for driving said first power supply by said synchronizing signal whereby said frequency of said first current is a function of said selected frequency, means for driving said second power supply by said synchronizing signal whereby said frequency of said second current is a function of said selected frequency; and means for delaying said synchronizing signal to said second power supply to phase shift said second current from said first current.

68. An electric arc welding apparatus as defined in claim 67 including means for operating one of said power supplies at a frequency different from said selected frequency upon response to one of said commands from said synchronizing signal.

69. An electric arc welding apparatus as defined in claim 68 wherein said operating means is an oscillator network having an output operated at said new frequency and driving said one of said power supplies and means for restarting said operating means upon receipt of said one of said commands from said synchronizing signal.

70. An electric arc welding apparatus as defined in claim 67 wherein said first and second low frequencies are in the general range of 5 to 200 Hz.

71. An electric arc welding apparatus as defined in claim 67 wherein said consumable electrodes are advance welding wires.

72. An electric arc welding apparatus as defined in claim 67 wherein said high frequency of each power supply inverter is over about 20 kHz.

73. An electric arc welding apparatus comprising at least a first consumable electrode and a second consumable electrode movable in unison along a welding path between the edges of two adjacent, mutually grounded plates, a first power supply for passing a first low frequency welding current between said first electrode and said plates, a second power supply for passing a second low frequency welding current between said second electrode and said plates, each of said power supplies including a three phase voltage input operated at line frequency, a rectifier to convert said input voltage to a DC voltage link and a high frequency switching type inverter converting said DC voltage link to a high frequency AC current, an output rectifier circuit to provide a positive voltage terminal and a negative voltage terminal, and an output switching network operated at a given low frequency for directing a pulsating welding current at said given low frequency from said terminals across one of said electrodes and said plates, a master controller for creating a synchronizing signal directed to said power supplies and having a succession of synchronizing commands and means for forcing said power supplies to start its low frequency current upon receipt of a synchronizing command.

74. An electric arc welding apparatus as defined in claim 73 including a delay circuit for delaying at one of said power supplies receipt of said synchronizing command for a selected time to phase shift said first and second welding currents.

75. An electric arc welding apparatus as defined in claim 74 including means for creating said low frequency of at least one of said power supplies upon receipt of said synchronizing command.

76. A method of electric arc welding with at least a first consumable electrode and a second consumable electrode movable in unison along a welding path between the edges of two adjacent, mutually grounded plates, a first power supply for passing a first low frequency welding current between said first electrode and said plates, a second power supply for passing a second low frequency welding current between said second electrode and said plates, each of said power supplies including a three phase voltage input operated at line frequency, a rectifier to convert said input voltage to a DC voltage link and a high frequency switching type inverter converting said DC voltage link to a high frequency AC current, an output rectifier circuit to provide a positive voltage terminal and a negative voltage terminal, and an output switching network operated at a given low frequency for directing a pulsating welding current at said given low frequency from said terminals across one of said electrodes and said plates:

(a) creating a synchronizing signal alternating between a positive command and a negative command at a selected frequency;

(b) driving said first power supply by said synchronizing signal whereby said frequency of said first current is a function of said selected frequency;

(c) driving said second power supply by said synchronizing signal whereby said frequency of said second current is a function of said selected frequency; and,

(d) delaying said synchronizing signal to said second power supply to phase shift said second current from said first current.

77. A method as defined in claim 76 including operating one of said power supplies at a frequency different from said selected frequency upon response to one of said commands from said synchronizing signal.

78. A method as defined in claim 77 wherein said operating act includes a provision of an oscillator network having an output operated at said new frequency and driving said one of said power supplies and further including the act of restarting said operating act upon receipt of said one of said commands from said synchronizing signal.

79. A method of electric arc welding apparatus with at least a first consumable electrode and a second consumable electrode movable in unison along a welding path between the edges of two adjacent, mutually grounded plates, a first power supply for passing a first low frequency welding current between said first electrode and said plates, a second power supply for passing a second low frequency welding current between said second electrode and said plates, each of said power supplies including a three phase voltage input operated at line frequency, a rectifier to convert said input voltage to a DC voltage link and a high frequency switching type inverter converting said DC voltage link to a high frequency AC current, an output rectifier circuit to provide a positive voltage terminal and a negative voltage terminal, and an output switching network operated at a given low frequency for directing a pulsating welding current at said given low frequency from said terminals across one of said electrodes and said plates, said method comprising:

(a) creating a synchronizing signal directed to said power supplies and having a succession of synchronizing commands; and,

(b) forcing said power supplies to start its low frequency current upon receipt of a synchronizing command.

80. A method as defined in claim 79 including the act of delaying at one of said power supplies receipt of said synchronizing command for a selected time to phase shift said first and second welding currents.

81. A method as defined in claim 80 including the act of creating said low frequency of at least one of said power supplies upon receipt of said synchronizing command.